Does WET Testing Need To Be Predictive?

All of the current controversies over whole effluent toxicity (WET) testing seem to me to arise from the attempt to unite two incompatible goals. One goal is the detection and elimination of effluent toxicity. The other goal is the evaluation of the toxicological health of the nation's waters. Both are worthy goals, but the techniques necessary for each are not readily interchangeable. In addition, the proper use of the information gained in pursuit of each goal is specific to that goal. The near complete separation of these two goals makes sense and eliminates the time wasting debates over WET.

Monitoring effluents for toxicity is a necessary activity in and of itself. This activity is primarily a regulatory strategy for detecting, identifying, and eliminating toxic substances or combinations of substances in effluents that would otherwise be missed. Effluents thoroughly characterized chemically and considered safe can still be toxic due to unknown constituents. Low flows will eventually occur, and even if control of effluent toxicity has been adequate for the last few years, controls must anticipate dry weather that will occur on average only once per decade or so.

A regulatory program to control effluent toxicity demands standardized tests which are reasonably available, affordable, and consistent. The current WET tests were developed to meet these requirements not to reflect receiving water conditions. For example, *Ceriodaphnia* and fathead minnow chronic tests are run at 25° C for 7 days to allow quantifiable differences in reproduction or growth between test concentrations to develop. Many test species were chosen because they are available by culturing which keeps costs low and tends to provide uniform sensitivity. Similar considerations in establishing standard test conditions have produced a suite of toxicity tests which are as practical for monitoring effluents as can be expected when testing is done quarterly or sometimes monthly. The standard tests are generally considered too expensive for higher monitoring frequencies.

Toxicity identification evaluations (TIEs) are another extremely important consideration in choosing whether to use standardized tests for monitoring effluents or to try to reflect receiving water conditions. TIEs are often difficult and can get very expensive when the toxicant is not identified within a few tries. Procedures for TIEs are only worked out for the standard WET tests. Labs are gaining experience in conducting TIEs mostly using the standard WET tests. Unknown toxicants detected by other techniques such as bioassessments will be most readily identified if captured in a standard toxicity test and subjected to a TIE.

On the other hand, using a standard WET test to evaluate receiving water quality is something like taking my temperature in order to see if my brother has a fever. We are related and both live in coastal Washington. There might be a correlation. However, the temperature measurement can and should be made directly.

If a laboratory toxicity test is to be used for assessing the health of a body of water, then the test should be performed on an ambient water sample and will be much more likely to be predictive than a WET test. *In situ* toxicity testing is another step closer to a direct assessment of the health of receiving water organisms by providing test organism exposure under real world conditions while maintaining some of the control of the lab tests. Ambient and *in situ* toxicity tests detect toxicity from all sources: point sources (industries and POTWs), nonpoint sources (stormwater and agriculture), and natural (toxic phytoplankton). Bioassessments are not only the most direct measure available of ecosystem health, but are the standard for comparison to determine the predictive accuracy of the toxicity tests. Bioassessments, and to a lesser extent *in situ* toxicity testing, also detect adverse effects that are not related to toxicity such as salutation, scouring by floods, diseases, or natural population cycles.

As the assessment of toxicity moves from the lab to the environment, the evaluation becomes more real world, but loss of controlled conditions makes drawing conclusions more complicated. Because of the multiplicity of potential sources for toxicity and the increased potential for adverse effects from causes other than toxicity, ambient toxicity testing, *in situ* toxicity testing, and bioassessments may launch at least a few more studies and debates before any decisions are made as to the causes and solutions to any problem encountered. Even the presence or absence of adverse effects can be controversial due to the disadvantages of trying to prove a negative especially given the limited situations where bioassessments give useful information and the limited availability of toxicity test species and endpoints. Uncertainty cuts both ways. Bravely examining the interaction between the natural and human worlds in all of its complexity and determining the facts slowly and deliberately is the realm of science. Science like this should be done more often; we need to know more about the toxicity of our waters and the effects of nonpoint sources of pollution.

The regulatory program for WET gets into trouble when it trespasses on the legitimate realm of scientific investigation through the use of "water quality-based" WET limits and the policy of independent application. WET testing is not a water quality assessment, but is more performance-based (Thou shalt not harm fathead minnows or *Ceriodaphnia*). WET testing should be done to discover unknown toxicants and to detect effluent toxicity at levels of concern for future low flow events. (Consider that ambient toxicity testing and *in situ* toxicity testing can only detect receiving water toxicity as it occurs, and bioassessments discover the results of events which have already occurred.) Any WET detected could be investigated as to cause and potential solution. Then, if water quality-based WET limits and independent application are ignored, a reasonableness test could be applied that considers both economic (cost of treatment) and environmental (fate of toxicant, results of bioassessments, etc.) factors before requiring the reducing of effluent toxicity. Such a regulatory system acknowledges the importance of WET testing and control without making it out to be something it is not.